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ABSTRACT

A patterned, synthetic, longitudinally exchange biased GMR sensor is provided which has a narrow effective trackwidth and reduced side reading. The advantageous properties of the sensor are obtained by satisfying a novel relationship between the magnetizations (M) of the ferromagnetic free layer (F1) and the ferromagnetic biasing layer (F2) which enables the optimal thicknesses of those layers to be determined for a wide range of ferromagnetic materials and exchange coupling materials. The relationship to be satisfied is $M_{F2}/M_{F1} = (J_s + J_{cx})/J_s$, where J_s is the synthetic coupling energy between F1 and F2 and J_{cx} is the exchange energy between F2 and an overlaying antiferromagnetic pinning layer. An alternative embodiment omits the overlaying antiferromagnetic pinning layer which causes the relationship to become $M_{F2}/M_{F1} = 1$.